

# EXHIBIT 35

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May 30, 2014

**REPORT TO:** Mr. Brent Perich  
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**FROM:** Ned Fortenberry, P.E.

**REFERENCE:** Post Fire Structural Analysis (Haman, Inc. - Knights Inn)  
D.o.I.: March 22, 2014  
L.o.I.: Bessemer, Alabama  
Claim Number: WKFA-020770  
ED&T File Number: BHM6907-92202



On May 13, 2014, Engineering Design & Testing Corp. (ED&T) was requested to conduct a post fire structural examination of a building and provide repair recommendations.

The conclusions and opinions stated herein are based on information available to the investigation as of this writing. It is conceivable that additional information may be forthcoming which bears on these conclusions and opinions. Therefore, the right is reserved to review and modify all conclusions and opinions at any future point in time should, in fact, additional information become available.



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For ease of reading, this report is divided into sections as follows:

- A. Background Information and Work of Investigation
- B. Observations
- C. Discussion
- D. Repair Recommendations

Figures 1-29 and Figures R1-R4 are included to clarify and amplify the following narrative.

**Appendices:**

- I. Aerial Photograph
- II. Knights Inn Ground Floor Layout
- III. Safety Concerns Letter issued by ED&T dated May 20, 2014

**A. BACKGROUND INFORMATION AND WORK OF INVESTIGATION**

On May 13, 2014, ED&T was requested to conduct a post fire structural examination of the Knights Inn located at 1121 9<sup>th</sup> Avenue Southwest in Bessemer, Alabama. An initial examination of the building in the area of the fire was conducted on May 15, 2014. Ms. Shelia Allen, Knights Inn Manager, Mr. Michael Brannon, Bessemer Fire Department, and Mr. Don Gaylor, Bessemer Building Official, were present for a portion of the examination. Subsequent examinations were conducted on May 16 and 17, 2014 to scan the columns in front of Room 170 and to scan a side wall of Room 171 for the presence of reinforcing steel. For report purposes, left/right and front/rear descriptions are provided as facing the front of each unit. Photographs were taken to document the examination. Select photographs, numbered as Figures 1-29 and Figures R1-R4, are included in this report. An aerial photograph is included as Appendix I.

Knights Inn is a motel that includes a lobby, meeting room building, and two wings of rooms with two stories of rooms on each wing (Appendix I and Figure 1). An arrow on Figure 1 shows the area where the fire originated. Ms. Allen reported that the fire appeared to have originated in Room 170, that the fire damaged several lower level rooms, and that other rooms were damaged as a result of smoke and water. Ms. Allen provided ED&T with a floor plan of the facility that depicted the first-story arrangements of the rooms. This floor plan is included as Appendix II.

On May 20, 2014, a letter regarding safety concerns was issued. The letter is included as Appendix III.

## **B. OBSERVATIONS**

1. Columns that aligned with the interior front-to-rear walls of each room had been constructed in front of each room (Figure 2). The columns supported a beam that supported the second-story walkway (Figure 3), and supported beams which supported a portion of the roof (Figure 4). The second-story walkway provided access to each second-story room. Each column was tapered with a vertical rear/inside face and a sloping front/outside face. The top of the columns were 21 inches from front-to-rear. At the floor level of the first-story, the bases of the columns were 41 inches from front-to-rear. Because the wing of the motel was constructed with an expansion joint that coincided with the left side wall of Rooms 170 and 270, and right side walls of Rooms 169 and 269, two columns were in front of the left side of Room 170 and 270.
2. When the fire caused the temperature of the walkway in front of Room 270 to rise, the concrete expanded and caused the columns in front of Rooms 170 and 270 to be subjected to a horizontal force resulting in a crack that was exhibited on the front face of the columns to the left and right sides of Rooms 170 and 270 (Figures 5 and 6).
3. A hole for a pipe was noted in the tapered portion of one of the columns (Figure 7). The hole revealed that the interior of the column at this location was hollow core concrete masonry unit (CMU) block that had been surfaced with two finish layers. To determine if the column was constructed with vertical reinforcing steel, a M12 sub-scanner detection tool, which was manufactured by Milwaukee Electric Tool Corporation, was used to determine if a ferrous metal was embedded in the column (Figure 8). Readings detected ferrous metal, which was interpreted as vertical reinforcing bars, in the rearmost 16 inches of the columns.

4. Along the front wall of Room 170, a concrete beam spanned from the left side CMU block wall to the right side wall (Figure 9). The beam was a nominal 8 inches wide by 12 inches deep. On the left end of the beam, the CMU block beneath the beam was fractured (Figure 10), and the beam exhibited a diagonal crack near the end that is consistent with shear failure of a beam (Figure 11). In Room 169 at the right side wall, the CMU block wall beneath the beam along the front wall exhibited a crack (Figures 12 and 13).
5. Inside Room 170, the ceiling was framed with 8 inch deep bar joists (Figure 14). These bar joists supported the metal floor deck and concrete floor for Room 270 above. Heat from the fire in Room 170 had distorted and caused failure of the bar joists. Figure 15 shows a location where the bar joists, metal decking, and floor of Room 270 had deflected/displaced downward. The concrete floor slab of Room 270 spanned from front-to rear and was supported by the bar joists which were spaced on two foot centers. The bar joists spanned from left-to-right and were supported by the CMU block walls on each side of each room. At each end of the bar joist, the end plate/seat was bearing on a cap block (Figure 16). Solid masonry spacer bricks had been placed on top of the cap block between the bar joists.
6. The right and left side walls of Room 170 were scanned to determine if vertical reinforcing steel was present. Figure 17, which is representative of the scans, shows the presence of ferrous metal at a depth of 4 inches from the surface of the right side wall at this location, indicating that a portion of the hollow cells had been filled with mortar/cement and a vertical rebar.
7. A Schmidt Model N/NR concrete test/impact hammer was used to check the relative compressive strength of the concrete floor of Room 170 and of the wall at several locations. The compressive strength of the floor was recorded in the range of 4800-

5300 pounds per square inch (psi). The compressive strength of the CMU block in the left side wall of Room 170 was in the range of 1700 psi. The compressive strength of the CMU block wall on the right side wall of Room 170 was in the range of 3200 psi.

8. The mortar on the right side wall of Room 170 was soft. Figure 18 shows a mortar joint where a portion of the mortar was removed with hand pressure with the edge of a chisel, indicating that the mortar was soft. ED&T requested and received permission from Ms. Allen to remove a portion of the finish of the left side wall of Room 171, which was adjacent and to the right of Room 170. The wall finish was wall paper that had been placed over wood paneling. No heat related damage to the wall paper or wood paneling was noted. After removal of the finish, the mortar was subjected to hand pressure from the edge of a chisel, creating a groove in the mortar, indicating that the mortar was soft. Figures 19 and 20 show one area of a mortar joint before and after application of hand pressure with the edge of a chisel. Compressive strength recorded in the wall at this location was in the 2800-3300 psi range.
9. In a few locations, the concrete floor of Room 170 exhibited shallow, curved irregular-shaped areas of missing concrete. Missing concrete in these areas is referred to as having spalled or popped-out. Figure 21 shows one of the areas where the concrete was spalled.
10. Room 169 (Figure 22) located to the left of Room 170, and Room 171 located to the right of Room 170, did not exhibit heat damage to the walls or ceiling finishes.
11. Room 270 (Figure 23), which is located directly above Room 170, exhibited smoke related damage to the walls and ceiling and a floor that sloped downward toward the center of the room. Room 269 (Figure 24), which is located to the left of Room 270,

did not exhibit heat related damage to the walls or ceiling. Room 271 (Figure 25), which is located to the right of Room 270, did not exhibit heat related damage to the walls or ceiling.

12. The roof above the area of the fire was surrounded by a high parapet wall (Figure 26). The sides of the parapet wall and the flat roof area were covered with a black-colored membrane. Figure 27 shows an expansion joint that corresponded to the building expansion joint between second-story Rooms 269 and 270 and between first-story Rooms 169 and 170. No damage to the roofing membrane was noted.

#### Other Observations

During the examination, several items were noted that caused a safety concern related to the stairs to the right of Rooms 171 and 271. Figure 28 shows a crack in the concrete in the intermediate landing between the first-story and second-story. The concrete was higher on one side of the crack than the other creating a tripping hazard. Figure 29 shows a cracked and sloped stair tread between the intermediate landing and the second-story level. These two items were addressed in the safety concerns letter issued on May 20, 2014 (Appendix III).



**C. DISCUSSION**

1. In conversations with others at the site and from observation, the origin of the fire was in Room 170. The heat from the fire caused expansion of the walkway floor above Room 170, which caused the floor slab to exert lateral pressure on the walls supporting the beam along the front wall of Room 170 and the columns in front of Room 170. As a result, the beam along the front wall of Room 170 fractured, and the two building expansion joint columns to the left of Room 170 and the column to the right of Room 170 cracked. Examination revealed that a portion of the columns, which were tapered in the front-to-rear direction, were hollow core CMU block and that vertical steel reinforcing bars had been placed in the rear 16 inches of the columns. These columns require replacement.
2. In Room 170, the bar joists in the ceiling had failed and deflected downward. These bar joists supported the concrete floor slab of Room 270, which was directly above. When the bar joists deflected downward, the concrete floor of Room 270 fractured and deflected downward, leaving the floor of Room 270 sloping toward the center of the room. The bar joists and floor slabs beneath Room 270 require replacement.
3. The original concrete compressive strength of the walls and floor slab of Room 170 are not known. Although core samples tested in a laboratory would be required to determine the exact compressive strength, the impact hammer can determine an approximate compressive strength and can determine if one area of the concrete has a compressive strength that is much lower than other areas. Measurements recorded with an impact hammer revealed that the floor of Room 170 and the right and left side walls exhibited high compressive strength levels. The right side wall of Room 170 exhibited mortar joints where mortar could be removed by hand pressure from the edge of a chisel, indicating that the mortar was soft. The mortar could be removed on

the side of the wall inside Room 170 and on the opposite side of the wall in Room 171. No heat damage had occurred in Room 171, leading to the conclusion that the soft mortar predated the fire.

4. Some areas of spalling had occurred on the concrete floor slab of Room 170. Debris will need to be removed to expose the entire surface for examination. However, testing of the areas where no spalling was present indicated that the concrete floor had exhibited a high compressive strength.

#### **D. REPAIR RECOMMENDATIONS**

The following recommendations are considered to be minimum repairs to structural elements damaged by the fire.

1. Figure R1: a) remove the beam denoted B1 and the walkway along the front of Room 270, b) remove the columns marked C1, C2, and C3 to a point of 4 feet above the ground surface, c) remove the concrete leaving vertical reinforcing steel from 4 feet down to 1 foot above the ground surface to allow for splicing new rebar for a replacement column. The above repairs require temporary shoring of the roof and roof support beams at the second-story roof and walkway at the second-story floor.
2. Figure R2: Remove the beam marked B2 from the left side wall to mid-point of the right side wall along the front wall of Room 170.
3. Figure R3: Remove the block at the front wall of Room 170 from the bottom of the beam downward to sound material. Leave vertical reinforcing steel exposed and replace block or place concrete to the underside of the beam.
4. Figure R4: Place temporary shoring beneath the beam along the front wall of Room 169. Remove block from the front wall of Room 169 from the bottom of the beam downward to sound material. Leave vertical reinforcing steel exposed and replace block or place concrete to the underside of the beam.
5. Remove the concrete floor and bar joists beneath Room 270. Two potential options of replacement of bar joists are: a) remove CMU block above each end of each bar joist for a sufficient distance to expose the seat of the bar joist and remove the weld between the embedded plate at the top of the wall and the seat of the bar joist. Install new bar joists to replace each existing bar joist, or b) cut existing bar joists leaving a

portion of the seat projecting beyond the face of the wall. Remove the spacer CMU bricks adjacent to each end of the existing joists and install a replacement beam adjacent to the existing bar joist seat. Design the replacement beam to be an eight inch deep, two piece wide flange that is spliced a nominal two feet from one end wall and is tapered to be inserted into the created openings. Place the beam adjacent to the remaining seat from the original bar joists. Connect the new beam to the old bar joist by a welded plate. (Note: Both options assume that the original bar joist is anchored to the CMU block by a plate at the top of the wall).

6. Areas that exhibited spalling can be repaired by using a bush hammer to remove an additional  $\frac{1}{2}$  inch of material, placing a bonding compound on the surface of the inside of the spalled area, and filling the void with cement rich sand/cement mixture or a quality epoxy grout.